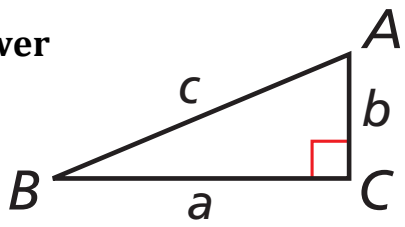
8.3 & 8.4 Study Guide: Solving Right triangles & Angles of Elevation/Depression

- I can use the relationship between the sine and cosine of complementary angles.
- I can solve problems involving angles of elevation and angles of depression.

<u>Attendance questions</u>. Use the triangle at the right to answer questions 1-3.



1. If a = 8 and b =5, find c. Write your answer as simplified radical.

2. If a = 60 & c = 61, find b.

3. If b = 6 & c = 10, find sin B. Write your answer as a fraction in simplest form and a decimal.

Find AB. Write your answer as radical in simplified form.

4. A(8, 10) & B(3, 0)

5. A(1, -2) & B (2, 6)

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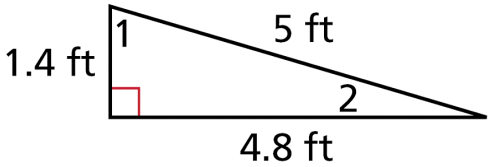
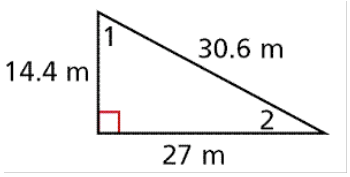
San Francisco, California, is famous for its steep streets. The steepness of a road is often expressed as a *percent grade*. Filbert Street, the steepest street in San Francisco, has a 31.5% grade. This means the road rises 31.5 ft over a horizontal distance of 100 ft, which is equivalent to a 17.5° angle. In this lesson we will learn how 17.5° was calculated.

Example 1: If $\cos A = \frac{24}{25}$, which angle, 1 or 2, is $\measuredangle A$?



6. Guided Practice: If $\sin A = \frac{8}{17}$, which angle, 1 or 2, is $\measuredangle A$?



List the exact values the following. Simplify and rationalize all denominators!

7. $\sin 45°$ **8.** $\cos 45°$ **9.** $\tan 45°$

10. $\sin 30°$ **11.** $\cos 30°$ **12.** $\tan 30°$

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List the exact values the following. Simplify and rationalize all denominators!

13. $\sin 60°$ **14.** $\cos 60°$ **15.** $\tan 60°$

16. If you solve a problem and the angle has a sine that is 0.5, what is the measure of the angle?

17. If you know the sine, cosine, or tangent of an acute angle measure, you can use the _____ trigonometric functions to find the measure of the angle.

Inverse Trignometric Functions
If sin A = x, then arcsin(x) = $m\measuredangle A$, sin A = x, then $\sin^{-1} x = m\measuredangle A$
If cos A = x, then _____ = $m\measuredangle A$, sin A = x, then $\cos^{-1} x = m\measuredangle A$
If tan A = x, then arctan(x) = $m\measuredangle A$, sin A = x, then _____ = $m\measuredangle A$

Trig Calculator: http://www.easycalculation.com/trigonometry/trigonometry.php

Example 2: Use your calculator to find the angle measures. Round your answer to the nearest degree.

18. cos A = 0.87 **19.** sin B = 0.85 **20.** tan D = 0.71

21. tan E = 0.75 **22.** cos F = 0.05 **23.** sin G = 0.67

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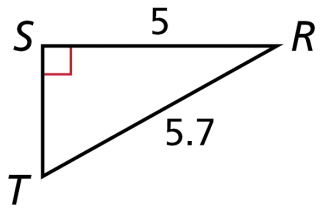
24. What does it mean to solve a right triangle?

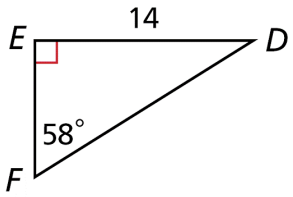
25. When you solve a right triangle, round angle measures to _____.

26. When you solve a right triangle, round side lengths to _____.

Example 3: Solve the right triangle.



27. Guided Practice: Solve the right triangle.



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Example 4: The coordinates of the vertices of ΔPQR are P(−3, 3), Q(2, 3), and R(−3, −4). Find the side lengths to the nearest hundredth and the angle measures to the nearest degree.

28. Guided Practice: The coordinates of the vertices of Δ*RST* are *R*(−3, 5), *S*(4, 5), and *T*(4, −2). Find the side lengths to the nearest hundredth and the angle measures to the nearest degree.

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Example 5: A highway sign warns that a section of road ahead has a 7% grade. To the nearest degree, what angle does the road make with a horizontal line?

29. Guided Practice: Baldwin St. in Dunedin, New Zealand, is the steepest street in the world. It has a grade of 38%. To the nearest degree, what angle does Baldwin St. make with a horizontal line?

Work on the 8.3 assignment.

An **<u>angle of elevation</u>** is the angle formed by a horizontal line and a line of sight to a point _____ the line. In the diagram, $\measuredangle 1$ is the angle of elevation from the tower *T* to the plane *P*.

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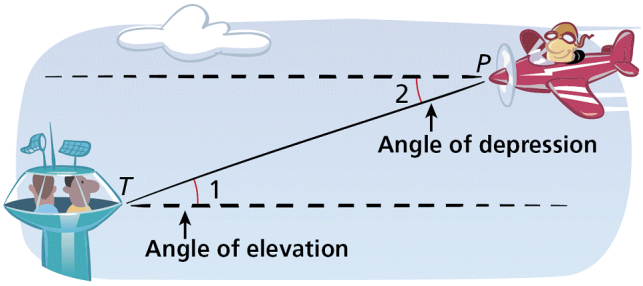
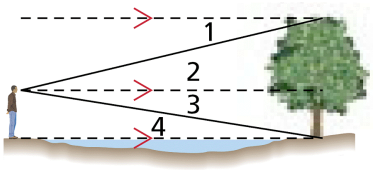
An **<u>angle of depression</u>** is the angle formed by a horizontal line and a line of sight to a point _____ the line. $\measuredangle 2$ is the angle of depression from the plane to the tower.



30. What is the relationship between $\measuredangle 1$ (angle of elevation) & $\measuredangle 2$ (angle of depression)? Explain how you know.

Example 1: Classify each angle as an angle of elevation or an angle of depression.

$\measuredangle 1$: $\measuredangle 4$



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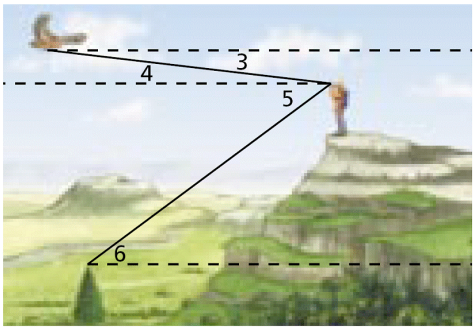
Guided Practice: Use the diagram above to classify each angle as an angle of elevation or angle of depression.



31. $\angle 5$ **32.** $\angle 6$

Example 2: The Seattle Space Needle casts a 67-meter shadow. If the angle of elevation from the tip of the shadow to the top of the Space Needle is 70º, how tall is the Space Needle? Round to the nearest meter.

33. Guided Practice: What if…? Suppose a plane is at an altitude of 3500 ft and the angle of elevation from the airport to the plane is 29°. What is the horizontal distance between the plane and the airport? Round to the nearest foot.

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Example 3: An ice climber stands at the edge of a crevasse that is 115 ft wide. The angle of depression from the edge where she stands to the bottom of the opposite side is 52º. How deep is the crevasse at this point? Round to the nearest foot.

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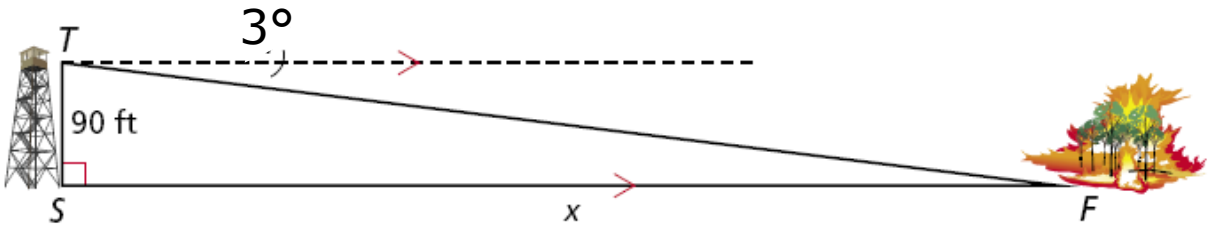
34. Guided Practice: What if…? Suppose the ranger sees another fire and the angle of depression to the fire is 3°. What is the horizontal distance to this fire? Round to the nearest foot.



"IF AT FIRST YOU DON'T SUCCEED, BLAME YOUR COMPUTER."

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Example 4: An observer in a lighthouse is 69 ft above the water. He sights two boats in the water directly in front of him. The angle of depression to the nearest boat is 48º. The angle of depression to the other boat is 22º. What is the distance between the two boats? Round to the nearest foot.

35. Guided Practice: A pilot flying at an altitude of 12,000 ft sights two airports directly in front of him. The angle of depression to one airport is 78°, and the angle of depression to the second airport is 19°. What is the distance between the two airports? Round to the nearest foot.